PB83-228882

Industrial Source Complex (ISC) Dispersion Model (Addendum/Supplemental Information)

(U.S.) Environmental Sciences Research Lab.
Research Triangle Park, NC

Dec 82

U.S. Department of Commerce
National Technical Information Service
NTIS

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/DF-83/007a	2.	PB83-228882

4. Title and Subtitle

Addendum/Supplemental Information for the ISC Model

5. Report Date: December 1982

6.

7. Author(s)

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

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10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address

13. Type of Report & Period Covered

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

This supplemental information on the ISC model is part of the documentation of the UNAMAP Version 5 package. It enables users to update their guide for this model. The coding changes documented in the report have already been made to the source code included as part of the UNAMAP Version 5 tape.

17. Document Analysis a. Descriptors

Atmospheric Sciences
Meteorology
Atmospheric Pollution
Air Pollution
Diffusion
Models
Simulation
Algorithms

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA 22161

18. Availability Statement

19. Security Class (This Report)	21. No. of Pages
20. Security Class (This Page)	22. Price

(See ANSI-Z39.18)

See Instructions on Reverse

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

December 1982

ADDENDUM/SUPPLEMENTAL INFORMATION

TO THE

INDUSTRIAL SOURCE COMPLEX (ISC) DISPERSION MODEL

The computer code modifications addressed herein are the complete set of changes made to date to the ISC code as it appears in the Industrial Source Complex (ISC) Dispersion Model User's Guide, Volume II, EPA-450/4-79-031, December 1979. All modifications have been incorporated in the ISC code as part of the UNAMAP-5 available from the National Technical Information Service (NTIS). The user should be aware that when all the changes recommended in this addendum are implemented, the test cases may provide concentration estimates that differ slightly from those obtained with the original version of ISC. These differences are on the order of a few percent. However, for applications of ISC to other sources and climatic regimes, implementation of the addendum could result in concentrations that differ significantly. The magnitude of the differences will depend on the individual source scenarios being considered.

Each item in this report is preceded by the date on which it was issued.

A. Computer Program Modifications

Program modifications are described below. The changes correct errors in the original source code released in December 1979.

INDUSTRIAL SOURCE COMPLEX (ISCST) PROGRAM

Make the following modifications to Appendix A of the User's Guide and check your program for conformance.

1. 4/80 - Change the following lines of code in subroutine MODEL to read as follows:

```
IYR=YR                                                    S0304630
YRS=SINNUM(IYR)                                           S0304640
YRC=COSNUM(IYR)                                           S0304650
IYR=YR                                                    S0304800
YRS=SINNUM(IYR)                                           S0304810
YRC=COSNUM(IYR)                                           S0304820
```

2. 4/80 - Delete subroutine UPWIND from the ISC Short Term model program.

   Subroutine UPWIND was originally placed in the ISCST to save computer time by eliminating calculations at polar coordinate receptors upwind of centrally located sources. Due to an error in the subroutine, it was incorrectly applied to some source/receptor combinations providing substantial but erroneous savings in computer run time. Correcting the subroutine though, resulted in only a negligible savings in run time. Since subroutine MODEL provides an in-line upwind check for all source/receptor combinations subroutine UPWIND is being deleted.

3. 4/80 - Change the following line of code in subroutine MAXOT to read as follows:

```
      IY=(K-1)/NXPNTS+1                                              S0300370
```

4. 12/80 - Change the following lines of code in subroutine MODEL to read:

```
1010  IF(ISW(4).NE.1.OR.HS+ZS-GRIDZ(IJ).GT.0.0.OR.ITYPE.EQ.2)GO TO 1020  S0304930
      IF(ITYPE.GT.0)GO TO 1095                                           S0305200
      IF(VS.LE.0.0)GO TO 1095                                            S0305220
1095  IF(ISW(4).NE.1.OR.ITYPE.EQ.2)GO TO 1100                            S0305480
```

These modifications are required to allow for the treatment of area sources as flat terrain sources as indicated in the documentation.

5. 12/80 - Insert the following line of code in subroutine MODEL:

```
      IF(I.EQ.1) JDY=JDAY                                            S0301795
```

12/80 - Delete line S0301930 from subroutine MODEL.

The modifications correct on error in the Julian Day for the selection of the meteorological card input data/no listing option.

6. 12/80 - Delete line S0306540 from subroutine MODEL

12/80 - Insert the following line of code in subroutine MODEL:

```
      DO 1290 K=1,NVS                                                S0306515
```

These modifications are necessary to eliminate the possibility of calculating an incorrect Vertical Term when ground-level concentrations are calculated from sources with significant gravitational settling.

7. 12/80 - Change the following lines of code in subroutine MODEL to read:

```
C     TEST FOR WAKE EFFECTS - CALCULATE XPLUME.                        S0304070
 780  DHA=3.*FM*GAMJI*UBARI*SSI                                        S0304110
```

12/80 - Insert the following line of code in subroutine MODEL:

```
      IF(1.570796327*UBARS*SSI.GT.HB+HB)DHA=DHA*SIN(SS*(HB+HB)*UBARI)  S0304115
```

12/80 - Delete line S0304170 from subroutine MODEL.

The modifications are required to correct a wake effects test plume rise calculation error.

8. 3/82 - Change lines S0106680 and S0106690 in subroutine INCHK to read:

```
      70 CALL INCHK(QF(I3),QF(I4),QF(I5),QF(I6),QF(I7),QF(I12))      S0106680
C                                                                    S0106690
```

The purpose of the modification is to remove call parameters referenced but not used in the subroutine.

9. 3/82 - Change lines S0200010 and S0200020 in subroutine INCHK to read:

```
      SUBROUTINE INCHK(GRIDX,GRIDY,XDIS,YDIS,GRIDZ,SOURCE)           S0200010
C                                                                    S0200020
```

The purpose of the modification is to remove parameters referenced but not used in the subroutine.

10. 3/82 - Change lines S0304090, S0304120, and S0304150 in subroutine MODEL to read:

```
C                                                                    S0304090
  790 DHAWAK = DHA**.33333333                                        S0304120
      DHAWAK = HS + DHAWAK                                           S0304150
```

The purpose of this modification is to correct an error in the calculation of plume rise when wake effects are necessary.

11. 3/82 - Change lines S0305770 and S0305780 in subroutine MODEL to read:

```
C                                                                    S0305770
      CALL SIGMAZ(XBARK,A2,BBAR,ISTUM2,IXDIST,1,SASIGZ,SBSIGZ,DUMMY) S0305780
```

The modification corrects an error in the calculation of sigma-z when wake effects are occurring.

12. 12/82 - Change lines S0104080 and S0104180 to read:

```
C     CARD GROUP 2 EQUALS 2                                          S0104080
C     CARD GROUP 2 EQUALS 2                                          S0104180
```

These changes correct an error in each of the comment cards.

13. 12/82 - Change line S0300680 to read:

```
      IF(HB .LE. 0.0 .AND. HW .LE. 0.0) GO TO 160                    S0300680
```

This change clears the virtual distance parameters of extraneous data values when virtual distances are not used.

14. 12/82 - Change line S0303680 to read:

```
      IF(ITYPE-1)680,880,880                                    S0303680
```

This change eliminates unnecesary point source plume rise calculations when volume and area sources are evaluated.

INDUSTRIAL SOURCE COMPLEX (ISCLT) PROGRAM

Make the following program line modifications to Appendix B of the User's Guide and check your program for conformance.

1. 4/80 - Change the following line of code in subroutine MODEL to read:

```
      IF (RD.GE.XMX) GO TO 1930                                 S0211230
```

This change allows sources located 100 m from a receptor to be considered for contribution to the receptor. This is compatible with the ISC Short Term Model.

2. 12/80 - Change the following line of code in subroutine MODEL to read:

```
      IF(ZP.LT.ZS.OR.TYPE.EQ.2)ZP=ZS                            S0211150
```

This modification is required to allow for the treatment of area sources as flat terrain sources as indicated in the documentation.

3. 12/80 - Change the following line of code in subroutine MODEL to read:

```
      IF(TYPE.NE.O.OR.JTYPE.EQ.O.OR.XB.GE.HB10)GO TO 1970       S0211740
```

This modification corrects a mis-coded switch used in the calculation of σ_z for stacks with wake effects and calculation distances less than 10 building heights.

4. 12/80 - Change the following line of code in subroutine OUTPT to read:

```
      IF(NOCOMB(NG).EQ.1.AND.IDSORC(NGT+1).GE.0)GO TO 260       S0301621
```

This modification is required to correct an error that allowed the print output for an individual source to be printed several times.

5. 12/80 - Change the following lines of code in subroutines OUTPT and HEADNG respectively to read:

```
      COMMON /HEAD/ MSG3(4),MSG4(8),IS,N3,I3,M3,ILN,LSTILN      S0300120
      COMMON /HEAD/ MSG3(4),MSG4(8),IS,N3,I3,M3,ILN,LSTILN      S0400110
```

6. 3/82 - Change lines S0105460 thru S0105530 and add lines S0105531 thru S0105533 of MAIN program as follows:

```
C    READ.  IF ANY VALUE IS INPUT GREATER THAN ZERO THE STABLE      S0105460
C    PLUME RISE IS USED.  IF ANY VALUE IS INPUT LESS THAN ZERO      S0105470
C    THE ADIABATIC TO UNSTABLE PLUME RISE IS USED.  IF A VALUE      S0105480
C    OF ZERO IS INPUT OR THE VALUE IS LEFT BLANK, THE PROGRAM       S0105490
C    USES A DEFAULT VALUE.  IF THE DEFAULT IS FOR THE FIRST VALUE   S0105500
C    ON THE CARD THE DEFAULT VALUE DEPENDS ON STABILITY.  IF THE    S0105510
C    STABILITY IS A, B, C OR D A VALUE OF ZERO IS USED.  IF THE     S0105520
C    STABILITY IS E THEN DPDZ = .02, IF F THEN DPDZ = .035.  IF     S0105530
C    THE SECOND THROUGH SIXTH VALUE ON A CARD IS ZERO OR NOT        S0105531
C    PUNCHED THE PROGRAM SUBSTITUTES THE PREVIOUS VALUE READ        S0105532
C    FROM THE CARD                                                  S0105533
```

The purpose of the modification is to clarify text and reflect changes.

7. 3/82 - Add lines S0106311 and S0106312 to MAIN program as follows:

```
C    IF A NEGATIVE VALUE IS INPUT, THE PROGRAM WILL SUBSTITUTE      S0106311
C    ZERO IN THE CALCULATIONS                                       S0106312
```

The purpose of the modification is to clarify text.

8. 3/82 - In subroutine MODEL, make the following changes:

Add lines S0202481, S0202482 and S0202505, and change lines S0202480 and S0202490 to read:

```
      IF(P(1,J) .NE. 0.0)GO TO 260                                  S0202480
      I = ISTBLE(J)                                                 S0202481
      IF(ISW(9) .EQ. 2.AND.J .GT. 1) I = I+1                        S0202482
      P(1,J) = PP(I)                                                S0202490
      IF(C7.LT.0.0)P(1,J) = 0.0                                     S0202501
```

Add line S0202531 and change lines S0202520 and S0202530 to read:

```
      IF(P(I,J) .EQ. 0.0) P(I,J) = C7                               S0202520
      C7 = P(I,J)                                                   S0202530
      IF(P(I,J) .LT. 0.0) P(I,J) = 0.0                              S0202531
```

The purpose of this modification is to correct an error in the assignment of default values to the wind profile power law exponent.

9. 3/82 - In subroutine MODEL make the following changes:

Add lines S0202801, S0202811, S0202825, and S0202855 and change lines S0202790, S0202800, S0202810, S0202840 and S0202850 to read:

```
      IF(DPDZ(1,J) .NE. 0.0) GO TO 350                              S0202790
      I = ISTBLE(J)                                                 S0202800
      IF(ISW(9) .EQ. 2.AND.J .GT. 1) I = I + 1                      S0202801
```

```
      IF(I .LT. 5)GO TO 350                                              S0202810
      DPDZ(1,J)= STBLE(I-4)                                              S0202811
      IF(C7.LT.0.0) DPDZ(1,J) = 0.0                                      S0202821
      IF(DPDZ(I,J) .EQ. 0.0) DPDZ(I,J) = C7                              S0202840
      C7 = DPDZ(I,J)                                                     S0202850
      IF(DPDZ(I,J).LT.0.0)DPDZ(I,J) = 0.0                                S0202851
```

The purpose of this modification is to correct an error in the assignment of default values to the potential temperature gradient (DPDZ)

10. 3/82 - Change line S0208820 in subroutine MODEL to read:

```
      IF(ISW(20).EQ.1.AND.VEL.LT.1.5*UBH)HBRIG(J,I) = H+VEL2D*UBHIS0208820
```

The purpose of this modification is to correct an incorrect I-switch (ISW) setting.

11. 3/82 - In subroutine MODEL, add line S0204481:

```
      IF (C8 .LE. 0.0) C8 = 22.5                                         S0204481
```

The purpose of this modification is to allow the input of one single wind direction.

12. 3/82 - In subroutine MODEL, add lines S0204961 and S0205051:

```
      IF(NSOURC .LT. 0) GO TO 685                                        S0204961
  685 WRITE (JUNT,9045)                                                  S0205051
```

The purpose of this modification is to output a warning message if there is doubt that all sources will fit into the available core.

13. 3/82 - In subroutine MODEL, change lines S0205830, S0206090, and add line S0207071:

```
      IF (NSOURC .EQ. 0) IFLG1 = 1                                       S0205830
      IF (NSOURC .GT. 0.AND.M1 .GT. NSOURC)GO TO 1120                    S0206090
      IF (NSOURC .LT. 0) NSOURC = M1 - 1                                 S0207071
```

The purpose of this modification is to output a warning message if there is doubt that all sources will fit into the available core.

14. 3/82 - In subroutine MODEL make the following changes:

Delete line S0215620 and add lines S0215620, S0215630, S0215640, and S0215650 as follows:

```
 9045 FORMAT (125HOWARNING - UNABLE TO DETERMINE IF ALL SOURCES WILL FITS0215620
     1 IN CORE (NSOURC<0). IF PROGRAM ABORTS, RERUN USING OUTPUT TAPE ORS0215630
     2 FILE/)
      END                                                                S0215640
                                                                         S0215650
```

This modification warns the user of possible core overflow.

15. 3/82 - In subroutine OUTPUT, change lines S0301190 thru S0301290 to read:

```
      CALL TITLR(2,1,0)                                                    S0301190
      WRITE(JUNT,9008) MSG6                                                S0301200
      WRITE(JUNT,9006) MSG2(I1),MSG2(I1+1),MSG2(I1+2),(I,I=1,NSEASN)       S0301210
      DO 200 L=1,J                                                         S0301220
      CALL TITLR(1,1,0)                                                    S0301230
      I2 = 1                                                               S0301240
      I3 = L                                                               S0301250
      IF (QFLG .EQ. 1) GO TO 190                                           S0301260
      I2 = L                                                               S0301270
      I3 = 1                                                               S0301280
  190 WRITE (JUNT,9007) L,(Q(I2,I3,I),I=1,NSEASN)                          S0301290
```

The purpose of this modification is to output a warning message if there is doubt that all sources will fit into the available core.

16. 12/82 - Change line S0208840 to read:

```
          C     MAX MOMENTUM RISE IS DLHSMX                              S0208840
```

This change is to inform the user of the variable name used for maximum momentum plume rise.

17. 12/82 - Add lines S0209161, S0209251 and S0209281 to read:

```
      DELHM=DELH(J,I,M+3)                                                  S0209161
      DELHM=0.5*DELH(J,I,M+3)                                              S0209251
      DELHM=DELH(J,I,M+3)                                                  S0209281
```

- Change line S0209340 to read:

```
        IF(XB .GT. DELHM)XB=DELHM                                          S0209340
```

- Change line S0212590 and add line S0212591 to read:

```
      IF (DPDZ(J,I) .GT. 0.0.AND.DELH(J,I,M+2) .LE. 0.0.AND.HP .GT. DLHSS0212590
     1MX(J,I)) HP = DLHSMX(J,I)                                            S0212591
```

These additions and changes correct an error in the algorithm used by ISCLT to calculate plume rise when the building wake effect option is used.

18. 12/82 - Change line S0200410 to read:

```
     1,QFLG1,QFLG2,QFLGS,WAKE,FMT,WAKE1,WAKE2                              S0200410
```

This change corrects format discrepancy by declaring WAKE1 as an interger.

B. 4/80 - Computer Underflow in the Short Term and Long Term Model Programs

An underflow interrupt condition occurs on computers whenever an arithmetic operation between two very small numbers results in a number too small to be contained in the computer's arithmetic results register. When this condition arises, computers such as the UNIVAC 1100 series and the CDC 6000 model programs were specifically designed to allow the computer to zero an underflow condition, therefore an underflow condition is not to be considered an error within the ISC programs.

However, some IBM computers abort the run when an underflow occurs. In order to circumvent this problem the user must inform the computer system that underflows are to be set to zero and program execution to continue. For example, the following FORTRAN call may be inserted at the beginning of either ISC Model program and thus preclude termination of runs due to underflows on an IBM 360 series computer:

```
CALL ERRSET (208,256,-1,1,0,208)
```

To find the appropriate solution to this problem on other computer systems, the user should contact on-site systems personnel.

C. 4/80 - Receptor Heights Versus Source Elevations

The ISC model allows each receptor to be situated at any height (z). Both the ISCST and ISCLT programs terminate, however, if the receptor elevation is above the lowest source height. In addition, if any receptor is located below the source base height, the ISC programs automatically reset the receptor height to the source base height (thus, flat terrain is assigned for that source receptor combination). This will cause a receptor to be located at different vertical points if two or more sources affect the same receptor, and are at different base elevations. To avoid this problem all sources should be located at approximately the same base elevation, thus maintaining a consistent correction among receptors that are below the plane of the sources.

The rationale for the above suggestion stems from the applicability of the ISC model primarily to very localized industrial sources and complexes, i.e., the sources are not located in radically different locations or terrain. The model can be used for widely dispersed sources, but the user's decision to assume similar source elevations should be an explicit one.

D. Text Corrections to the User's Guide

Volume I

1. 4/80 - All discussion and figures pertaining to the subroutine UPWIND are to be disregarded.

2. 12/80 - Page 3-6, Receptor Grid System Option. Delete sentence 3 and replace it with:

Additionally, a "3" value will automatically generate a grid system using the Cartesian coordinate system and a "4" value will automatically generate the polar coordinate direction radials with user-defined starting locations and spacing distances.

3. 12/80 - Page 2-24. The exponential term in Equation (2-12) should be:

$$\exp\left[-\frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2\right]$$

4. 12/80 - Page 3-42, Table 3-4. Line 10 in the Description which pertains to ISW(2), should be changed such that the line reads:

   4= program generates polar coordinate grid direction radials

5. 4/80 - Page 3-60. Add to equation (3-1) the term "+D".

6. 4/80 - Page 3-61. To the list of variables and their definitions add:

   D=201*NAVG*NGROUP if ISW(18) equals "1" in the first card of Card Group (2); otherwise D equals "0".

7. 12/80 - Page 4-10. Equation (4-1) should be changed to read:

$$\left.\begin{array}{l} J = 300 \\ \text{and} \\ I = \dfrac{(E-(N_x + N_y + 2.N_{xy}) - K - L - M)}{(N_{se}.(N_x.N_y + N_{xy}))} \end{array}\right\} \qquad (4\text{-}1)$$

8. 12/80 - Page 4-11, lines 9 and 11. References to "N_s" should be changed to "N_{se}".

9. 12/80 - Page 4-11. To the list of variables and their definitions add:

$$M = \begin{cases} 0 \text{ ; if ISW(4)=1 \& ISW(11)=2 or} \\ \quad \text{if ISW(7)=1 or NSEASN=1 or NGROUP=0} \\ N_x.N_y+N_{xy} \text{; if ISW(4)=0 or ISW(11)}\neq 2 \text{ \&} \\ \quad \text{if ISW(7)}\neq 1 \text{ \& NGROUP}\neq 0 \text{ \& NSEASN}\neq 1 \end{cases}$$

10. 12/80 - Page 4-16. Equation (4-2) should be changed to read the same as equation (4-1).

11. 12/80 - Page 4-17, equation (4-3). Reference to "N_s" should be changed to "N_{se}".

12. 12/80 - Page 4-77. Equation (4-4) should be changed to read:

$$\left.\begin{array}{l} J = 300 \\ \text{and} \\ I = \left[\dfrac{E - (NXPNTS+NYPNTS+2*NXWYPT) - K - L - M}{NSEASN*(NXPNTS*NYPNTS+NXWYPT)} \right] \end{array}\right\} \quad (4\text{-}4)$$

13. 12/80 - Page 4-78. To the list of variables and their definitions under "Condition c" add:

$$M = \begin{cases} 0 \text{ ; if ISW(4)=1 \& ISW(11)=2 or} \\ \quad \text{if ISW(7)=1 or NSEASN=1 or NGROUP=0} \\ NXPNTS*NYPNTS+NXWYPT \text{; if ISW(4)=0 or ISW(11)}\neq 2 \text{ \&} \\ \quad \text{if ISW(7)=1 \& NSEASN=1 \& NGROUP=0} \end{cases}$$

14. 12/80 - Page 4-79. Equation (4-5) should be changed to read the same as equation (4-4).

15. 12/80 - Page 4-80. Delete variable "L" and replace it with:

"where L and M are the same as under Equation (4-4)".

16. 12/82 - Replace the entire contents of pages 4-34 and 4-35 with the following text:

DPDZ (Cont.)

$\left(\dfrac{\partial\theta}{\partial z}_{i,k} \text{ in Table 2-4}\right)$ classified according to wind speed and stability category in units of degrees Kelvin per meter. There are NSTBLE (1 through NSTBLE) data cards read with the values for wind speed categories 1 through NSPEED read from each card. A value of $\dfrac{\partial\theta}{\partial z}$ greater than zero indicates stable thermal stratification and a value of $\dfrac{\partial\theta}{\partial z}$ less than zero indicates unstable thermal stratification. However, because a blank input field is interpreted as zero, the program assumes a zero input value means a default value is desired. Also, because the same plume rise equation is used for adiabatic and unstable conditions, a negative input value will direct the program to use the plume rise equations for adiabatic or unstable thermal stratification. If the first value on a data card is not

punched or is zero, a default value is used that depends on the stability category. If the stability category is A, B, C or D, the value is left as a zero and the adiabatic/unstable plume rise equation is used. However, if the stability category is E or F, the value defaulted is 0.02 degrees Kelvin per meter for E and 0.035 degrees Kelvin per meter for F stability. When any of the second through sixth values of DPDZ on a data card are input as a zero or are blank, the program will default to the previous value on the data card.

UBAR

Wind Speed -- This parameter array consists of the median wind speeds in meters per second ($\bar{u}_1$ in Table 2-4) for the wind-speed categories used in the calculation of the joint frequency of occurrence of wind speed and direction (STAR summary). There are NSPEED values read from this card if any value is not punched or is zero, the program defaults to the following set of values: 0.75, 2.5, 4.3, 6.8, 9.5 and 12.5 meters per second.

THETA

Wind Direction -- This parameter array consists of the median wind direction angles in degrees for the wind-direction categories used in the calculation of the joint frequency of occurrence of wind speed and direction (STAR summary). There are NSCTOR values read from 1 to 2 data cards and if the first two values of this array are not punched or are zero, the program defaults to the following standard set of values: 0, 22.5, 45, 67.5, 90, . . ., 337.5 degrees (N, NNE, NE, . . ., NNW). The wind direction is that angle from which the wind is blowing, measured clockwise from zero degrees (north).

P — Wind Speed Power Law Exponent This parameter array consists of the wind speed power law exponents (p in Equation (210)) classified according to wind speed and stability category. There are NSPEED (1 through NSPEED) values read per data card for stability categories 1 through NSTBLE. If the first value on any data card in this set is not punched or is zero, the program defaults to the value from the following set of values: A = 0.1, B = 0.15, C = 0.2, D = 0.25, E = 0.3, F = 0.3 depending on the stability category A through F. Also, if any of the second through last value on a card is not punched or is zero, the value is defaulted to the previous value on the data card. If a negative value is input, the result is a wind speed power law exponent of zero.

e. Source Data These data consist of all necessary information required for each source. These data are divided into three groups: (1) parameters that are required for all source types, (2) parameters that are required for stack type sources, and parameters that are required for volume sources and area sources. The order of input of these parameters is given at the end of this section.

17. 12/82 - On page 4-24 replace the text under b. Receptor Data with the following:

b. Receptor Data These data consist of the (X,Y) or (range, azimuth) locations of all receptor points as well as the elevations of thereceptors above mean sea level. The minimum distance in meters between source and receptor for which calculations are made is given by -

Stack Sources:

$$\text{minimum distance} = \begin{cases} 100 & ; \text{ no wake effects} \\ \text{MAX}\{100, 3*HB\} & ; \text{ wake effects, squat building} \\ \text{MAX}\{100, 3*HW\} & ; \text{ wake effects, tall building} \end{cases}$$

Building Sources:

minimum distance = 100 + 2.15*SIGYO

Area Sources:

minimum distance = 100 + 0.5*BW

Where:

HB = height of building

HW = width of building

SIGYO = standard deviation of the lateral source dimension of building

BW = width of area source

18. 12/82 - On page 3-26 replace the text describing the Stack-Source Parameter "WAKE" with the following:

WAKE — Supersquat Building Wake Effects Equation Option -- This option is used to control the equations used in the calculation of the lateral virtual distance (Equations (2-31) and (2-33)) when the effective building width to height ratio (BW/HB) is greater than 5. If this parameter is not punched or has a value of "0" and the width to height ratio is greater than 5, the program will use Equation (2-31) to calculate the lateral virtual distance producing the upper bound of the concentration or deposition of the source. If this parameter has a value of "1", the program uses Equation (2-33) producing the lower bound of the concentration or deposition for the source. The appropriate value for this parameter depends on building shape and stack placement with respect to the building (see Section 2.4.1.1.d).

19. 12/82 - On page 3-27 replace the text describing the Stack-Source Parameter "HW" with the following:

HW* — Building Width -- This parameter specifies the width of a building adjacent to this stack (meters). The effective width used by the program is the diameter of a circle of equal area to the rectangle given by HL and HW.

Volume II

1. 4/80 - All discussion and figures pertaining to subroutine UPWIND are to be disregarded.

2. 4/80 - Page C-4, Figure C-1. The zero in card column 59 in the first card should be changed to a "6" such that the data value reads "860".

3. 4/80 - Page C-8, Figure C-1. The data in card columns 8 and 9 are to be transferred to columns 9 and 10 respectively with column 8 becoming blank. The change should be made for each of the 16 cards illustrated.

4. 4/80 - Page D-8, Figure D-1. The zero in card column 25 on the fourth last card should be changed to a "6" such that the data value reads ".0076794".

5. 4/80 - Page C-19, paragraph 1. Delete sentence 3 and replace it with:

   Also, because ISW(4) equals "0" and ISW(15), ISW(17) and ISW(18) equal "1", variables A, B, C and D respectively equal 0, 425 times 5 (or 2125), 4 times 1 times 425 times 5 (or 8500), and 201 times 1 times 5 (or 1005) according to their definitions given in Equation (3-1).

6. 4/80 - Page C-19. Add to equation (C-2):

   variable version - "+D"
   numerical interpretation - "+0"

7. 12/80 - Page D-24. The numerical solution in equation (D-3) should be changed to read:

$$40000 \geq 19+19+2*1 + (2*1+0) * (19*19+1)$$

$$\geq 764$$

E. Example Problem Updates to the User's Guide.

1. 12/82 - This update contains replacement pages for portions of the first ISCLT example problem (particulate concentration) in Volume II, Appendix D. The changes in concentration values for this example are the result of past addendum modifications affecting stack sources influenced by building wake affects. Replace pages D-52 through D-54 and D-56 through D-58 with the following six pages respectively.

** ANNUAL GROUND LEVEL CONCENTRATION (MICROGRAMS PER CUBIC METER) DUE TO SOURCE 15 **

Y AXIS (DISTANCE , METERS)	- GRID SYSTEM RECEPTORS - X AXIS (DISTANCE, METERS) - -3000.000	-2000.000	-1500.000	-1250.000	-1000.000	-800.000	-600.000	-400.000	-200.000
	- CONCENTRATION -								
3000.000	.166541	.192335	.208870	.216050	.222574	.229596	.235654	.240499	.243920
2000.000	.244018	.274214	.301155	.323336	.344970	.361338	.376127	.394439	.408603
1500.000	.291765	.358930	.388783	.401732	.444204	.479210	.513295	.544438	.578918
1250.000	.312002	.407637	.458406	.482024	.504258	.555533	.608727	.660359	.710680
1000.000	.323171	.459372	.536662	.578998	.620455	.649545	.723030	.808862	.891982
800.000	.330972	.482428	.603567	.665088	.732086	.786207	.835139	.948148	1.078041
600.000	.337526	.495793	.640016	.745131	.853845	.942446	1.032987	1.111859	1.279252
400.000	.342636	.505190	.654767	.765193	.915443	1.078302	1.258025	1.403964	1.487312
200.000	.346139	.509944	.660335	.771518	.923065	1.087131	1.304170	1.591369	1.737880
.000	.344298	.502478	.644275	.747084	.884490	1.029275	1.211963	1.429699	1.619741
-200.000	.320502	.450316	.555403	.624113	.704776	.773620	.830096	.833196	.811791
-400.000	.295894	.396618	.465248	.501452	.531196	.545963	.575638	.575986	.579045
-600.000	.270952	.343438	.379108	.395130	.422736	.438134	.438707	.445326	.483847
-800.000	.246130	.292776	.321707	.338858	.350233	.350321	.356999	.503441	.699921
-1000.000	.221839	.257383	.281623	.289432	.289977	.295428	.392712	.518428	.658127
-1250.000	.192736	.226515	.237746	.237695	.256208	.323367	.405724	.504793	.568701
-1500.000	.174423	.197520	.200846	.214099	.273110	.330940	.398797	.467938	.498295
-2000.000	.146291	.152455	.192135	.231306	.276064	.317113	.357083	.377767	.397013
-3000.000	.102904	.151674	.192505	.215636	.236089	.249302	.260265	.270753	.280514

Y AXIS (DISTANCE , METERS)	- GRID SYSTEM RECEPTORS - X AXIS (DISTANCE, METERS) - .000	200.000	400.000	600.000	800.000	1000.000	1250.000	1500.000	2000.000
	- CONCENTRATION -								
3000.000	.245766	.245915	.232888	.218698	.203769	.188440	.169238	.152128	.128332
2000.000	.417367	.419797	.383586	.363414	.301643	.260276	.225965	.196112	.147530
1500.000	.602100	.610405	.536419	.454857	.373218	.318912	.261368	.214233	.198255
1250.000	.749716	.764926	.650202	.526444	.423126	.348525	.272733	.236488	.246566
1000.000	.955871	.981543	.792270	.598963	.469654	.366408	.304932	.314902	.298930
800.000	1.173483	1.202141	.910112	.658988	.485656	.379920	.400569	.392302	.347635
600.000	1.438972	1.413327	.976610	.664631	.491497	.530644	.519590	.482165	.439603
400.000	1.621248	1.411376	.870203	.619787	.733821	.728443	.693666	.647393	.561468
200.000	1.673262	.666888	.695726	1.062480	1.159236	1.098030	.965525	.837929	.646189
.000	1.171512	.000000	1.491328	1.868046	1.655157	1.422176	1.171619	.978461	.722528
-200.000	.822233	1.419617	.933050	1.137303	1.178956	1.103075	.972265	.846575	.654634
-400.000	1.027620	1.249217	.838265	.700210	.793947	.821400	.778638	.712050	.583019
-600.000	.934955	1.026316	.772545	.637922	.557890	.598728	.613174	.588805	.511694
-800.000	.809753	.866377	.703626	.575402	.511833	.452995	.478676	.483507	.445742
-1000.000	.706518	.745930	.634794	.526082	.469488	.421693	.374110	.395607	.387936
-1250.000	.604001	.631713	.557895	.482330	.422842	.386150	.343053	.308778	.325008
-1500.000	.525004	.545997	.494047	.439727	.387193	.355175	.320637	.288580	.272770
-2000.000	.413908	.427602	.398676	.367963	.337034	.307083	.282095	.260154	.219156
-3000.000	.289340	.297018	.285000	.272291	.259253	.246114	.229950	.215044	.190975

FIGURE D-2. (Continued)

** ANNUAL GROUND LEVEL CONCENTRATION (MICROGRAMS PER CUBIC METER) DUE TO SOURCE 16 (CONT.) **

- GRID SYSTEM RECEPTORS -
- X AXIS (DISTANCE, METERS) -

Y AXIS (DISTANCE 3000.000 , METERS)	- CONCENTRATION -
3000.000	.090868
2000.000	.146172
1500.000	.190297
1250.000	.215323
1000.000	.259838
800.000	.302422
600.000	.346623
400.000	.391488
200.000	.435959
.000	.468690
-200.000	.441116
-400.000	.412121
-600.000	.382384
-800.000	.352619
-1000.000	.323485
-1250.000	.290310
-1500.000	.261334
-2000.000	.211497
-3000.000	.152033

- DISCRETE RECEPTORS -

X RANGE (METERS)	Y AZIMUTH BEARING (DEGREES)	CONCENTRATION	X RANGE (METERS)	Y AZIMUTH BEARING (DEGREES)	CONCENTRATION	X RANGE (METERS)	Y AZIMUTH BEARING (DEGREES)	CONCENTRATION
2108.0	14.0	.352765						

- 10 CONTRIBUTING VALUES TO PROGRAM DETERMINED MAXIMUM 10 OF COMBINED SOURCES 16,

X COORDINATE (METERS)	Y COORDINATE (METERS)	CONCENTRATION
-200.00	200.00	1.937880
600.00	.00	1.868046
.00	200.00	1.673262
800.00	.00	1.655167
.00	400.00	1.621248
-200.00	.00	1.619741
-400.00	200.00	1.591369
400.00	.00	1.491328
-200.00	400.00	1.487312

FIGURE D-2. (Continued)

** ANNUAL GROUND LEVEL CONCENTRATION (MICROGRAMS PER CUBIC METER) DUE TO SOURCE 15 (CONT.) **

- 10 CONTRIBUTING VALUES TO PROGRAM DETERMINED MAXIMUM TO OF COMBINED SOURCES 16.

X COORDINATE (METERS)	Y COORDINATE (METERS)	CONCENTRATION
.00	600.00	1.438972

FIGURE D-2. (Continued)

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** ANNUAL GROUND LEVEL CONCENTRATION (MICROGRAMS PER CUBIC METER) FROM COMBINED SOURCES -16.

Y AXIS (DISTANCE, METERS)	- GRID SYSTEM RECEPTORS - X AXIS (DISTANCE, METERS) - -3000.000	-2000.000	-1500.000	-1250.000	-1000.000	-800.000	-600.000	-400.000	-200.000
	- CONCENTRATION -								
3000.000	16.495097	20.130838	21.818654	22.708929	23.304716	23.964036	24.451553	24.723050	24.745682
2000.000	26.921179	33.143428	38.268564	41.338161	43.962647	45.502753	47.859991	49.527788	50.247664
1500.000	33.874858	47.282870	54.736169	59.106605	66.179856	71.277436	75.910732	80.222919	83.315542
1250.000	38.363940	56.491411	68.256859	75.354197	82.814068	92.139174	100.158619	107.764859	113.751154
1000.000	43.359299	66.762465	86.632895	97.781056	111.589131	121.550339	138.544250	156.805546	166.390163
800.000	41.984438	76.152910	103.569020	122.192135	142.300175	165.229168	184.249102	215.834602	243.702751
600.000	43.333025	81.251863	124.270690	150.548239	187.347878	222.581280	277.266193	324.470979	387.744160
400.000	44.349752	85.400480	134.057196	176.214527	247.304970	309.227623	409.943756	577.493256	715.030647
200.000	44.969796	88.021979	141.345184	189.879309	270.379368	387.482162	601.628685	969.379189	1517.782028
.000	45.837026	90.746032	147.691511	200.789335	291.763462	430.056297	703.387360	1352.423447	3335.945442
-200.000	41.866970	79.066730	122.626130	160.249929	218.997089	298.122351	424.774712	580.153404	1152.781631
-400.000	38.710989	69.477236	101.621900	126.033317	161.497753	191.470797	253.487730	356.314220	720.522171
-600.000	35.357730	59.373425	80.787533	94.131777	117.546819	140.807564	188.190038	330.000416	506.591972
-800.000	31.898789	49.382185	65.302284	77.749384	91.960516	113.166515	161.391808	239.992842	342.232925
-1000.000	28.412144	42.157119	55.646056	63.637803	77.030821	103.191373	143.198275	234.200756	245.770800
-1250.000	24.384893	36.381078	45.005245	52.391989	71.318754	93.458879	120.120549	153.087809	176.967554
-1500.000	21.567442	31.117918	38.287640	49.653776	66.265575	82.292159	103.949560	119.953331	134.065332
-2000.000	17.681820	23.442932	35.737605	44.267107	54.116972	64.214720	72.130870	79.308579	85.514814
-3000.000	11.852598	21.196622	27.879222	32.300282	35.631073	38.244498	40.720339	42.976346	44.931561

Y AXIS (DISTANCE, METERS)	- GRID SYSTEM RECEPTORS - X AXIS (DISTANCE, METERS) - .000	200.000	400.000	600.000	800.000	1000.000	1250.000	1500.000	2000.000
	- CONCENTRATION -								
3000.000	24.896995	23.532425	22.379735	21.114830	19.731995	18.268542	16.572417	14.991436	12.555948
2000.000	50.999894	46.643001	42.807608	38.520796	34.812134	30.256937	26.356147	22.871345	17.779933
1500.000	85.266548	75.343410	66.290206	56.808045	48.098793	41.314344	33.975372	29.487196	23.320268
1250.000	118.191324	101.473871	85.931916	69.627211	58.405411	48.459352	40.772791	39.431083	35.588226
1000.000	176.169977	144.518215	117.586698	90.215961	71.197325	60.783580	57.464342	53.812260	44.290231
800.000	265.314167	204.829454	147.637827	110.728327	90.657006	84.275874	76.824242	67.892156	55.961575
600.000	447.877949	310.303204	203.239521	153.288277	134.313572	119.566225	100.495667	92.149679	71.914912
400.000	912.201202	478.739483	322.657021	253.415390	203.874018	186.067677	152.814417	125.935431	98.404998
200.000	2562.573883	1029.200867	622.593796	515.429214	374.394447	280.635475	208.138626	160.603079	104.505907
.000	54.687102	3798.396332	1725.348114	922.766548	572.620934	392.263779	271.214615	199.948589	123.149832
-200.000	2906.397308	1546.952591	937.174736	664.225883	452.380528	326.230732	235.125727	177.980536	113.137949
-400.000	1285.313492	738.680183	542.867546	403.179470	312.508734	264.023342	199.041256	156.159786	103.604592
-600.000	685.591942	491.623123	343.301373	268.568405	221.502041	189.789095	155.187698	133.290920	92.869339
-800.000	426.483036	335.488701	249.285006	194.792368	162.500058	143.031366	124.507435	137.066039	81.893466
-1000.000	290.359524	242.502314	199.810888	158.439152	128.515932	111.073517	98.521058	98.361392	69.671944
-1250.000	201.511539	175.227417	149.010174	122.620461	105.159534	88.972157	75.637553	59.026005	58.439022
-1500.000	149.126501	133.036066	117.167570	100.723143	86.731353	75.637976	63.320912	55.315656	48.518773
-2000.000	92.441470	85.052760	77.932043	70.050601	61.946707	55.581481	49.020990	43.040431	35.910583
-3000.000	47.261750	44.811255	42.503674	39.986363	37.273858	34.432343	31.170507	28.386023	24.057968

FIGURE D-2. (Continued)

** ANNUAL GROUND LEVEL CONCENTRATION (MICROGRAMS PER CUBIC METER) (CONT.) FROM COMBINED SOURCES -16,

- GRID SYSTEM RECEPTORS -
- X AXIS (DISTANCE, METERS) -

Y AXIS (DISTANCE 3000.000 , METERS) - CONCENTRATION -

3000.000	8.806818
2000.000	16.727619
1500.000	22.490680
1250.000	26.718436
1000.000	33.481662
800.000	39.129361
600.000	44.854812
400.000	50.535981
200.000	56.029958
.000	62.434136
-200.000	59.096867
-400.000	56.111707
-600.000	52.756561
-800.000	49.143379
-1000.000	45.368329
-1250.000	40.840383
-1500.000	35.718437
-2000.000	28.134523
-3000.000	17.150499

- DISCRETE RECEPTORS -

X RANGE (METERS)	Y AZIMUTH BEARING (DEGREES)	CONCENTRATION	X RANGE (METERS)	Y AZIMUTH BEARING (DEGREES)	CONCENTRATION	X RANGE (METERS)	Y AZIMUTH BEARING (DEGREES)	CONCENTRATION
2108.0	14.0	39.185023						

- PROGRAM DETERMINED MAXIMUM 10 VALUES -

X COORDINATE (METERS)	Y COORDINATE (METERS)	CONCENTRATION
200.00	.00	3798.396332
-200.00	.00	3536.946442
.00	-200.00	2905.397308
.00	200.00	2562.573883
-200.00	200.00	1817.782028
400.00	.00	1725.348114
200.00	-200.00	1546.952591
-400.00	.00	1352.623447
.00	-400.00	1285.313492

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D-5

FIGURE D-2. (Continued)

** ANNUAL GROUND LEVEL CONCENTRATION (MICROGRAMS PER CUBIC METER) (CONT.) FROM COMBINED SOURCES -16.

- PROGRAM DETERMINED MAXIMUM 1U VALUES -

X COORDINATE (METERS)	Y COORDINATE (METERS)	CONCENTRATION
-200.00	-200.00	1152.781631

FIGURE D-2. (Continued)